PATENT COOPERATION TREATY

07-03-05

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

~~Fax in advance~~ (error)

Date of mailing
(day/month/year) 01.03.2005

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Applicant's or agent's file reference	IMPORTANT NOTIFICATION	
TS 0036 PCT/Kr/H		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 03/11337	03.10.2003	04.10.2002
Applicant		
DANIELI CORUS TECHNICAL SERVICES BV		

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
TS 0036 PCT/Kr/H		

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 03/11337	03.10.2003	04.10.2002

International Patent Classification (IPC) or both national classification and IPC

C10B7/10

Applicant

DANIELI CORUS TECHNICAL SERVICES BV

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
10.02.2004	01.03.2005

Name and mailing address of the international preliminary examining authority:

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I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-10	as originally filed

Claims, Numbers

1-26	received on 17.02.2005 with letter of 14.02.2005

Drawings, Sheets

1/3-3/3	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-26
	No:	Claims	
Inventive step (IS)	Yes:	Claims	16,17
	No:	Claims	1-15,18-26
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: US-A-5 296 005 (WOLFE RICHARD A ET AL) 22 March 1994 (1994-03-22) cited in the application
   D2: WO 92 19372 A (CHRISTIAN ENGINEERING) 12 November 1992 (1992-11-12)
   D3: US-A-1 458 492 (MATHEWS PAUL L ET AL) 12 June 1923 (1923-06-12)
   D4: US-A-1 468 379 (WILLIAM EASTON ROWLAND) 18 September 1923 (1923-09-18)
   D5: CA-A-2 303 795 (TODORSKI Z) 27 September 2001 (2001-09-27)
   D6: LEWIS D W: 'APPLICATIONS OF POLYMER EXTRUSION TECHNOLOGY TO COAL PROCESSING' SAMPE QUARTERLY, vol. 12, no. 4, July 1981 (1981-07), pages 4-7, XP008013154
   D7: US-A-4 584 060 (WENNING PETER ET AL) 22 April 1986 (1986-04-22)
   D8: NL-C-1 009 664 (ROLLEPAAL B V MASCHF DE) 18 January 2000 (2000-01-18)
   D9: EP-A-0 025 319 (PYRO CONVERSION INC) 18 March 1981 (1981-03-18)
   D10: DE-A-198 37 277 (ECO IMPACT UNTERNEHMENSBERATUN) 24 February 2000 (2000-02-24)
   D11: Ullmann's Encyclopedia of Industrial Chemistry, 5th edition, volume A20, pages 677-683 (1992)

   The documents D10 and D11 were not cited in the international search report.

2. For the establishment of this report, independent claim 1 is interpreted as including "and of which the distance between the shafts of the screws is at most the addition of the height of the blades on both screws", which is part of the definition mentioned on page 2, lines 15-19 of the current specification and which has been partly introduced in claim 1 (Article 34(2)(b) PCT).

3. The present application does not meet the requirements of Article 33(1) PCT,

because the subject-matter of claims 1-15 and 18-26 does not involve an inventive step in the sense of Article 33(3) PCT in view of at least one of the documents D1 to D11.

3.1 The subject-matter of independent claim 1 is novel in view of the available prior art, since none of the cited documents disclose the use of the apparatus as defined in claim 1 for pyrolytical treatment of material.

Thus, the subject-matter of independent claim 1 and dependent claims 2-26 fulfills the requirements of Article 33(2) PCT.

3.2 The invention of independent claim 1 consists merely in a new use of the apparatus known from document D11. The current application discloses only advantages in relation to the processing of coal, which becomes **plastic and sticky** during treatment. No unexpected effects have been shown in relation to other materials to be subjected to pyrolytical treatment.

Hence, no inventive step is present in the subject-matter of independent claim 1 over the whole scope claimed. Claim 1 does not fulfill the requirements of Article 33(3) PCT.

3.3 Dependent claims 2-15 and 18-26 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, involve an inventive step with respect to the prior art named in the present proceedings.

The reasons therefor are that the additional features of the said claims either are directly known from documents D1-D11, or is a combination of features obvious to the man skilled in the art in consideration of the disclosure of the prior art named in the present proceedings, or they concern only minor modifications which lie within the normal practice of the man skilled in the art.

3.4 The document D1 is regarded as the closest prior art for the subject-matter of claims 16 and 17.

Document D1 (the references in parentheses applying to this document) discloses a

coal pyrolyser unit (31) consisting of an externally heated retort chamber (32), wherein a **pair of interfolded screw conveyors,** of which the screws rotate in **opposite directions (i.e. counter rotate)**, are mounted. The retort chamber is provided with vents. The residence time of the coal in the pyrolyser is approximately 20 minutes; the retort chamber is heated to 1400°F (760 °C) (see column 3, lines 2 to 25; figure 1). The screws can be seen as self-cleaning (see column 4, lines 60-63).

It is contemplated that the feature "interfolded" is the same as the feature "intermeshing"; the same goes for "screw conveyor" and "extrusion screw".

D1 does ambiguously disclose that the screws fit closely in the housing such that the material undergoing the treatment has to stay between the blades of the screws, nor does it mention the thickness of the blades.

According to the applicant, who has participated in the project that used the apparatus of D1, in D1 thin blades have been used, with which no efficient mixing could be realised.

The problem underlying the invention is to provide both an efficient transport of the coal in all three phases -heating phase, reaction phase and product forming phase- and an efficient mixing of the coal, especially in phase 2 of the process.

It has been found that the thickness of the blades of the intermeshing double extrusion screw is very important to solve the above problem. The solution is not obvious in light of D1 nor does D1 contain a hint to solve the problem as defined in the claims.

The applicant has only filed arguments with respect to coal as the material to be treated under pyrolytical conditions.

Therefore, only the subject-matter of claims 16 and 17 involves an inventive step as required by Article 33(3) PCT.

4. Certain defects in the international application

4.1 The description should be brought into conformity with the new claims to be filed (Rule 5.1(a)(iii) PCT); the definition of the problem underlying the invention should be presented in the description in such terms that its solution can be better understood in view of the available prior art (Rule 5.1(a)(iii) PCT).

4.2 To meet the requirements of Rule 5.1(a)(ii) PCT, documents D6, D10 and D11 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

Amended CLAIMS for PCT / EP 03 / 11337, proposal 14 February 2005

1. Use of an apparatus for the treatment of a material, the apparatus comprising a housing, wherein in the housing a counter rotating intermeshing double extrusion screw is provided, wherein an intermeshing double extrusion screw is defined as an extrusion screw of which two approximately parallel screws have blades such that the thickness of a blade is at least half the distance between two neighbouring blades, wherein the two screws fit closely in the housing such that the material undergoing the treatment has to stay between the blades of the screws, wherein the treatment is processing the material in the housing under pyrolytical conditions.

2. Use of an apparatus according to claim 1, wherein the extrusion screw has a hollow shaft.

3. Use of an apparatus according to claim 2, wherein the blade or blades on the hollow shaft are hollow as well.

4. Use of an apparatus according to any one of claims 1 – 3, wherein the extrusion screw has a double blade over at least part of its length.

5. Use of an apparatus according to any one of the claims 1 – 4, wherein the extrusion screw has a blade with a variable pitch.

6. Use of an apparatus according to any one of claims 1 – 5, wherein the extrusion screw has a blade with sections of alternating short pitch and long pitch.

7. Use of an apparatus according to claim 6, wherein the extrusion screw has a blade having one section having a short pitch, one section having a long pitch, preferably also having an end section having an end pitch.

8. Use of an apparatus according to claim 6 or 7, wherein before each section of the extrusion screw having a blade with a long pitch a kneading element is present between the shaft of the extrusion screw and the housing.

9. Use of an apparatus according to any one of the claims 1 – 8, wherein the housing has one or more outlets for the gasses formed and/or one or more outlets for products formed.

10. Use of an apparatus according to claim 9 in conjunction with claim 6, 7 or 8, wherein for at least each section of the extrusion screw having a blade with a long pitch an outlet for the gasses formed is present in the housing.

11. Use of an apparatus according to any one of claims 1 – 10, wherein the distance between the shaft of the screw and the housing is at least of the same order as the distance between two successive blades, preferably the distance between the shaft and the housing being larger than the distance between two successive blades.

12. Use of an apparatus according to any one of claims 1 – 11, wherein the screw has a shaft on which internals such as paddles and/or rods are provided.

13. Use of an apparatus according to any one of claims 1 – 12, wherein the housing is double walled.

14. Use of an apparatus according to any one of claims 1 – 13, wherein the housing and/or the extrusion screw have been made from cast iron, preferably nodular cast iron.

15. Use of an apparatus according to any one of claims 1 – 14, wherein the housing has a length between 1 and 25 metres, preferably between 8 and 15 metres, more preferably approximately 12 metres.

16. Use of an apparatus according to any of the preceding claims, wherein the material is coal and the treatment is directed at making char.

17. Use of an apparatus according to any of the preceding claims wherein the treatment of the coal under pyrolytical conditions takes place in three phases, a heating phase of the material, a reaction phase in which the material may become at least partially plastic and a third phase in which one or more processed products are formed, wherein the processed products are formed in the housing while the material and the products in the housing are transported by means of the counter rotating intermeshing double extrusion screw.

18. Use of an apparatus according to claim 17, wherein the extrusion screw is self-cleaning during the transport of the material and the processed products.

19. Use of an apparatus according to claims 17 or 18, wherein the material and the processed products are kneaded during transport.

20. Use of an apparatus according to any of the preceding claims, wherein the extrusion screw rotates with a velocity of at most 25 rounds per minute, preferably at a velocity of approximately 1 round per minute.

21. Use of an apparatus according to any of the preceding claims 17 to 20, wherein the material and the processed products are heated to a maximum temperature of 300° C to 1000° C, preferably to a temperature of 400° C to 700° C, more preferably to a temperature of approximately 600° C.

22. Use of an apparatus according to any one of claims 17 - 21, wherein the transporting time of the material and the processed products in the housing is between 10 and 60 minutes.

23. Use of an apparatus according to any one of claims 17 to 22, wherein the material and the processed products are treated under a pressure of 0,5 to 5 bar in the solid/liquid/gas phase.

24. Use of an apparatus according to any one of claims 1 to 15, wherein the material is iron ore or metal oxide and the treatment is making steel or metal in the presence of a reducing agent.

25. Use of an apparatus according to any one of claims 1 to 15, wherein the material is tar and/or oil and the treatment is making petrol, diesel fuel and/or other chemicals.

26. Use of an apparatus according to any one of claims 1 to 15, wherein the material is biomass, tyres or waste and the treatment is making oil and gas.